JUN 1955

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— No. 6

E, 1955

Insect Control
June, 1955

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Governor LeRoy Collins (left) prepares to sample a special citrus punch which symbolizes a nation-wide citrus summer promotion pointing up the value of "Citrus Coolers for Summer Health." The bowl, inscribed in gold, was presented to the Governor by Frank D. Arn of the Florida Citrus Commission on behalf of the National Citrus Merchandising Committee. After the presentation, Governor Collins wired top executives of more than 14,000 retail stores asking their cooperation in featuring Florida citrus products throughout the summer.

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Citrus Insect Control

R. B. Johnson

For June 1955

W. L. THOMPSON,
R. M. PRATT
R. B. JOHNSON*
Florida Citrus Experiment Station, Lake Alfred

W. L. Thompson

Purple mite activity increased slowly through May, and the average infestation is at a high level. Recent showers have had no noticeable effect on the population, but continued general rains could bring about a reduction. Normally infestations reach a peak sometime in June, and for this reason further heavy infestations are to be expected unless the rainy season should start much earlier than usual.

Purple scale activity is at a high level and a new hatch is expected to begin in the last week in May. Levels of infestations in June and July will be high. Most of the scales will be in the younger stages by the middle of June.

Red scale activity was low in May but a hatch is expected to begin early in June. Most of the scales will be in the younger stages by mid-June. Infestation levels are not expected to be particularly high during the month.

Rust mite activity has been low since January. An increasing trend is to be expected in June and it is possible for a very rapid increase in infestation to occur in this period.

Six-spotted mite infestations have declined rapidly from the high level reached early in May and control measures are no longer required. Mealybug infestations are increasing rapidly and will be a problem in more groves than usual this year.

SPRAY PROGRAM

The citrus insect and mite control program for June will, in general, be no different from other years. As usual, there are exceptional problems in some groves. A few heavy infestations of mealybugs have been reported and purple mite populations are too high in some groves while rust mites are increasing in others. Where there are heavy mealybug or purple mite infestations it would be well to apply a scalicide in early June, using the combination of materials which will control the other pests present as well as the scales.

Scale Control: Except where scale insect populations are very high, where mealybugs or purple mites complicate the scale control program, or where very large acreages are involved, it is preferable to delay scalicide sprays until after the middle of June. Better control will be obtained, especially if only one scalicide spray is used per year, by waiting for the peak of young stages.

If parathion is to be used as the scalicide, spraying should be started where mealybugs or rust mites are also a problem. Use 1 pound of 15 percent parathion or its equivalent where scale infestations are low or where two applications are used, but use the larger dose of 1 2/3 pounds of 15 percent parathion for heavy infestations, where mealybugs are also a problem, and where only one application is used per year. Add 5 pounds of wettable sulfur to parathion sprays for rust mite control. Where purple mites as well as scale insects are a problem, oil emulsion at 1.3 percent actual oil is the preferred scalicide. However, supplemental sulfur sprays may be needed for rust mites where oil emulsion or a mixture of oil emulsion and parathion (0.7 percent actual oil plus 1 pound of 15 percent parathion per 100 gallons) is used. Do not use oil on very dry trees and remember that an early June oil application may cause a blotch on oranges ⅜ inch to 1½ inches in diameter. If oil is to be used on tangerines, reduce the concentration of oil to 1 percent actual oil in dilute sprays.

Malathion, a newer and much safer phosphatic insecticide than parathion, is an effective scalicide. It can be used for scale control anywhere and at any time that parathion can be used, but is especially recommended around houses and other locations where parathion cannot be used. Malathion should be used at 3 to 5 pounds of 25 percent powder or 1 to 1.5 pints of 57% liquid per 100 gallons.

Mealybug Control: Most mealybugs are now under the buttons of the fruit, between adjoining leaves, and among fruit hanging in clusters. Some mealybugs and cottony masses of their eggs may also be found on limbs and trunks. Infestations on fruit are easily detected by masses of sooty mold and sticky honeydew at the stem-end of the fruit. In groves where mealybugs are numerous the spray program should be timed for them. Parathion at 1 2/3 pounds per 100 gallons is the most effective insecticide for mealybugs. Early June sprays are more effective than later ones, but regardless of the time of application, as thorough coverage is needed for good mealybug control as for good scale control.

Whitefly Control: The early summer generation of whitefly usually occurs in June and most of their eggs are laid by the end of the month. Since the best control of whitefly is obtained with sprays applied after the eggs are laid, summer scalicide sprays should be postponed until late June if whitefly control is needed. Either oil or parathion is effective.

Purple Mite Control: No miticide as effective as oil emulsion has yet been found. Sprays containing 0.7% actual oil are sufficient for purple mites, but inadequate for scale; if scale as well as purple mite is to be controlled, add either 1 pound of 15% parathion to the oil or increase the oil to 1.3 percent.

Either ovex or aramite, both compatible with parathion and sulfur, may be substituted for oil for purple mites. However, ovex is preferred to aramite where purple mite eggs are numerous, but it should not be used more than once a year in any one grove.

Rust Mite Control: Application of parathion and sulfur sprays for scale control should be started in groves where rust mites are now a problem, with rust mite-free groves saved for later spraying. If oil emulsion is to be used, control rust mites with sulfur three or four weeks before or

(Continued on Page 15)

* Written May 25, 1955. Reports of surveys by Harold Holtsberg, Cocoa; J. W. Davis, Tavares; K. G. Townsend, Tampa; T. B. Weeks, Avon Park; and T. B. Hallam, Lake Alfred.

Governor Boosts Citrus Campaign

Governor LeRoy Collins accepted a large citrus punch bowl set from the National Citrus Merchandising Committee today, and appealed to more than 14 thousand retail groceries throughout the nation to share in the benefits of promoting Florida citrus products.

The punch bowl set, a hollow stemmed 386-ounce bowl with two dozen crystal punch cups, was inscribed to Governor Collins from the National Committee which represents citrus interests in Florida, California, Arizona and Texas. It was presented to the Governor by Frank D. Arn, chairman of the National Committee and Director of Merchandising for the Florida Citrus Commission.

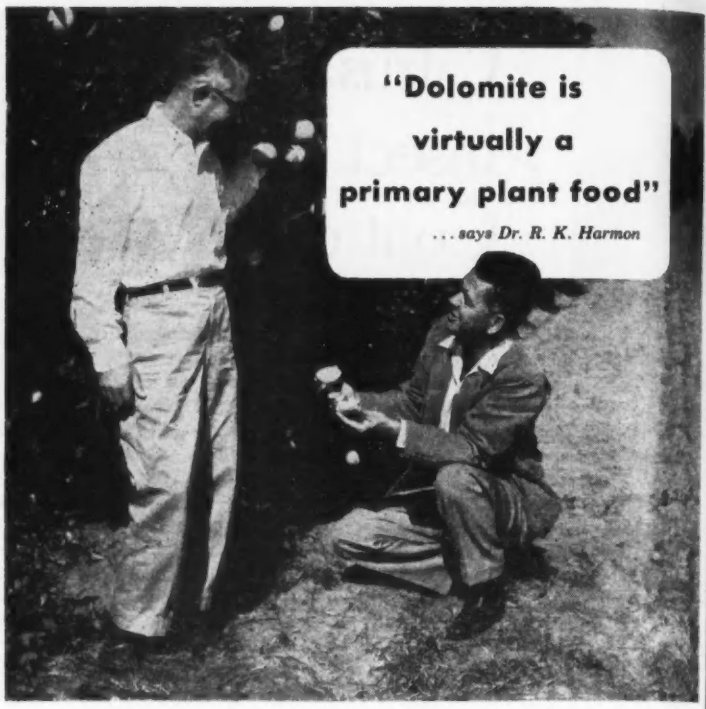
The presentation was timed to coincide with a nation-wide citrus summer promotion under the theme "Citrus Coolers for Summer Health." Both California and Florida will join in the promotion, but Calfornia interests will emphasize fresh oranges and lemonade, while Florida will support its canned and frozen orange and grapefruit products.

In a wire to the executives of 14,048 retail groceries, Governor Collins asked their cooperation in featuring Florida citrus products.

"Florida citrus products", the Governor's wire read, "both canned and frozen, are playing a major role in the annual summer promotion to be sponsored by the National Citrus Merchandising Committee, starting June 9th, under the theme 'Citrus Coolers for Summer Health'.

"I wish to take this opportunity, therefore to express the hope that you might cooperate with us in the promotion of Florida's products and sunshine in your advertising and sales plans throughout the summer. You may wish to pass on this message to those of your staff having such responsibility."

The Governor's wire will kick off the Florida Citrus Commission's summer advertising and merchandising program which will utilize the full 65-man field force of the Commission supported by full color advertisements in 60 newspaper supplements, 600-line black and white ads appearing in 146 major daily newspaper, half pages in four leading magazines, and additional support from the Tom Moore "Florida Calling" radio broadcast over a major network of 560 radio stations.



Dr. R. K. Harmon, Winter Haven grower and cattleman, and Bill Cook, d/p DOLOMITE Field Representative, examining fruit in Doctor Harmon's grove.

Doctor Harmon is a druggist as well as a citrus grower and rancher. As a druggist he appreciates the importance of magnesium and calcium in plant and animal health. As a grower and cattleman he is aware that d/p DOLOMITE keeps his groves and pastures in better health, his yields bigger and his profits higher.

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Greasy Spot Control

— By —
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W. L. THOMPSON

This article is a progress report on the control of greasy spot and it is written in answer to request for results of research accomplished to date. Data in this report are intended to be used as a guide for control of greasy spot during the season of 1955, but more detailed work on all phases of this problem is necessary before final conclusions can be drawn.

Former workers, Stephens (4) Fawcett and Lee (1) and Rhodes and DeBusk (3) reported that no organism had been found associated with this disease. In 1948 (6) the senior author reported that greasy spot was more severe in untreated checks than in plots where rust mite, Phyllocoptruta oleivora (Ash.), infestations had been kept at a low level with sulfur sprays. Also, greasy spot was reported more severe in plots where post-bloom sprays containing compounds of copper and zinc plus either wettable sulfur or oil had been applied without additional sulfur sprays, than where the same post-bloom sprays were followed with sulfur for rust mite control. In later work, (7) it was reported that greasy spot was less severe in plots sprayed in July or August with sulfur.

Although the 1948 work pointed to the rust mite as the apparent cause of greasy spot, later work has indicated a fungus as the factor. Greasy spot did not develop where heavy infestations of rust mites were maintained on potted seedling grapefruit trees in the greenhouse. It also has been established that greasy spot can develop on leaves kept free of rust mites with repeated sprays of aramite (2-(p-tert-butylphenoxy) isopropyl 2-chlorethyl sulfite). In this experiment, individual twigs on eight trees were tagged and inspected for rust mites every two weeks. If one rust mite was found on any leaf on any tagged twig, the whole plot was sprayed with aramite. Rust mites were never found on five of the eight trees, yet greasy spot developed on leaves of some of the five trees where no rust mites had been observed. On those trees, greasy spot was more severe on the second flush of growth of late April and early May and on a June flush, than on the early March or late July flushes. In comparsion, greasy spot was more severe on each flush on unsprayed trees than where rust mites were controlled with aramite.

In 1952, Shoichi Tanaka and Shunichi Yamada reported from Japan that greasy spot (black melanose) was caused by a fungus Mycosphaerella Horii (Hara). (4) and Miss Francine Fisher of this Station has also found a fungus associated with greasy spot (unpublished data).

Since it appeared that greasy spot in Florida might be caused by a fungus, an experiment was set up in 1953 to determine whether a fungicide would control greasy spot and to determine whether it would develop on trees where the rust mite population was kept to a minimum. For this experiment, a Marsh grapefruit grove about 10 years of age was selected. This grove was divided into three blocks and each treatment was applied to a plot 4 by 4 trees square in each block. Records of rust mite populations as well as occurence of greasy spot were taken from the four center trees in each plot. Records of greasy spot were obtained by picking 100 leaves per tree at random. The leaves were then divided in the laboratory into four classes or grades, based on

R. B. JOHNSON

J. W. SITES

the severity of greasy spot infection on each leaf. Sample leaves were used to determine each classification. The severity of greasy spot in each plot was computed by multiplying the number of leaves in the light grade by 1, in the medium by 2, and in the severe by 3. Products were added and then divided by the number of sample trees in each plot, so average ratings per tree or plot in one experiment could be compared with those in another. Thus the higher the rating the greater the severity of greasy spot. The same arrangement of plots and system of sampling were used in 1954, except that a twig of the current years growth was selected at random and the fourth leaf from the terminal was picked for the sample.

In the 1953 experiment, greasy spot was more severe in untreated plots and in plots where no sulfur was applied after June 20, Table 1. The least amount of greasy spot was in plots where a neutral copper (53% metallic) at 1.5 pounds per 100 gallons was combined with a wettable sulfur spray applied on August 7. In these plots, the rating of greasy spot was 41 as compared with 166 in the unsprayed checks and 189 where no sulfur was applied after June 20. Where seven applications of wettable sulfur were applied between April 4 and October 19, the rating of greasy spot was about the same as in unsprayed checks.

In 1953, records of severiy of greasy spot were also taken in other experiments. It had been previously observed that greasy spot was less severe where oil emulsion had been applied in either July or early August than in plots where the oil application had been made in March or April. To check this observation, the only treatment applied to one set of plots during 1953 was a July application of oil emulsion (0.65% actual oil) plus one pound of 15% parathion per 100 gallons. The severity or rating of greasy spot was 21 as compared to 54 in the unsprayed check. The rust mite infestation remained at a low level through July, but over 40% of the fruit was infested by August 17 and a peak infestation of 95% was reached by September 14. The infestation remained high through September, but declined to 12% by October. In a sulfur-dusted plot in the same experiment, the greasy spot rating was 42 or twice that of the oil-parathion plot, but the percentage of infested fruit was never higher than 52. Also, the sulfur-dusted plot had a much shorted period of rust mite infestation than where oil-parathion was applied. In a third set of plots that received a complete spray program, the greasy spot rating was 10. These plots received post-bloom copper plus wettable sulfur for melanose and rust mite control, and a combination of oil and parathion on June 24. On July 17, an average of two percent of the fruit was infested with rust mites and by August 17 this had risen to 75%. On August 20, the plots were thoroughly sprayed with wettable sulfur at 8 pounds per 100 gallons. The greatest amount of greasy spot occurred in a fourth set of plots that were left unsprayed. Data from this experiment indicated that oil was a factor in preventing greasy spot infection and that rust mites were not an important factor, if any, in causing it.

Table 1
Severity of Greasy Spot Following Different Spray Programs in 1953

Spray Programs* Amounts of Materials per 100 Gallons	Greasy Spot Ratings: Area 3 ft. to 5 ft. from ground	Tree tops
*Check (No treatment after March 24)	166	220
April through July, wettable sulfur 5 lbs. August through October, wettable sulfur 5 lbs., lime sulfur 3 qts.	135	188
April through July, wettable sulfur 5 lbs. August 6. Basic copper 1.5 lbs., wettable sulfur 5 lbs. September and October, wettable sulfur 5 lbs., lime sulfur 3 qts.	41	41
April through June 20, wettable sulfur 5 lbs. No treatment after June 20	189	197
L.S.D. 19:1	7	20
99:1	10	29

*March 24: The whole grove was sprayed with basic copper sulfate 1.5 pounds plus wettable sulfur 10 pounds per 100 gallons.

The results of the 1953 experiments indicated that a carefully timed oil spray or a copper spray would be more important for greasy spot control than any attempt to keep rust mite populations at a low level with sulfur sprays. While the authors considered that a great deal of further experimental work was indicated before a final solution of the problem could be achieved, the results of these experiments combined with similar results obtained by Miss Fisher (2) were of such importance that they were discussed with many grove men in the industry who were plagued by this problem. As a result many trials were started by production men using either copper sprays or oil emulsions during the summer. As will be indicated in this paper, some of these experiments failed to give good results because of improper timing.

Since the 1953 experiments demon-

strated that greasy spot could be controlled with copper, to a certain extent with oil emulsion, and to a lesser extent with lime-sulfur (8); 1954 experiments were set up to test several different materials; to test different concentrations of copper; and to vary the timing of copper and oil sprays. Three experiments were conducted in different groves. One experiment was in an Excelsior grapefruit grove (Grove No. 1) at the Citrus Experiment Station in which four-tree-plots were triplicated and the second was in a Marsh Seedless grapefruit grove (Grove No. 2) about one mile from the Station in which four-tree-plots were replicated four times. In both groves the plot arrangement was the same as described for the 1953 experiments. The third experiment was in a grove in the Lake Wales area where greasy spot had been very severe for several years. Two blocks, one Hamlin oranges and the other Red grapefruit, were treated at the same time and with the same materials. The plots in this grove were not randomized, but each treatment was replicated three times. Two-row plots of twenty trees in the Hamlins and eighteen trees in the grapefruit were used for each replicate. Trees in this grove were small, so fifty leaves per tree were collected for the greasy spot sample from each of four trees per replicate or a total of twelve trees per treatment.

Since the results of the three 1954 experiments varied somewhat between groves, tentative conclusions must take into consideration all experiments rather than any single experiment. For that reason, results from these tests are presented in the following discussion under the heading: "Spray Materials", "Amounts of Copper", "Timing of Sprays", "Fruit Quality", "Effect of Copper Sprays on Subsequent Mite and Scale Infestation", and "Suggested Spray Program" rather than reporting the experiments individually.

Spray Materials: A neutral copper application gave the most satisfactory control of greasy spot, Table 2. Unfortunately, copper compounds accentuate and darken almost any corky lesions on oranges making them a definite grade-lowering factor. Oil emulsion at 1.3% actual oil were next to copper in effectiveness. The combination of parathion and 0.7% oil was as effective as 1.3% oil in two of the three experiments, but Grove No. 3 where greasy spot was more severe, control with 0.7% oil was significantly lower than with 1.3% oil, but better than with wettable sulfur. Zerlate (zinc dimethyl dithiocarbamate) at two pounds per 100 gallons resulted in some degree of control, but was not as effective as either copper or oil. One application of two pounds of captan (N-trichloromethylmercapto - 4 - cyclohexene - 1 - 2 dicarboximide) per 100 gallons was no more effective than zerlate, but two applications, applied July 6 and August 7 were as effective as one copper application. Lime-sulfur at one gallon per hundred plus five pounds of wettable sulfur was effective in Grove 2 where July and August applications were made, but not effective in Grove 3 where the applications were made in June and July. Data from previous experiments (6) would indicate that July or August application may be necessary if lime-sulfur is to be a factor in greasy spot control.

Wettable sulfur was not effective in any of the experiments, in spite of the fact that in some previous experiments greasy spot was not as severe where wettable sulfur was applied in July or August. Since results have been very variable and in many cases negative, wettable sulfur should not be depended upon to control greasy spot.

Amounts of copper: The minimum amount of copper necessary for effective control has not been determined. In Groves No. 1 and No. 2 where different concentrations of copper were compared, a neutral copper (53% metallic copper) at 0.75 pound per 100 gallons was as effective as 1.5 pounds, Table 3. It should be noted that these applications were made in August. At present it is not known whether a late June or early July application of 0.75 pound would be as effective. Dosages of one pound and 1.5 pounds of neutral copper were

Table II.
Comparative Severity of Greasy Spot Following July Sprays.

Scalicides and Supplements Fungicides in amounts per 100 gallons	Greasy Spot Rating (Max Possible Severity = 300) Grove No. 1 Grapefruit	Grove No. 2 Grapefruit	Grove No. 3 Grapefruit	Grove No. 3 Oranges
Checks — No treatment after post-bloom spray	41	64	92	86
Parathion + wettable sulfur	56	39	104	81
Parathion + wettable sulfur + lime sulfur, 1 gal (1)	*	12	121	87
Parathion + wettable sulfur + neutral copper (53% metallic), 1 lb.	5	11	28	32
Parathion + wettable sulfur + zerlate, 2 lbs	*	30	*	*
Parathion + wettable sulfur + captan, 2 lbs.	*	25	*	*
Parathion + wettable sulfur + captan, 2 lbs. July 7 — wettable sulfur + captan, 2 lbs. August 4	*	9	*	*
Parathion + oil emulsion (0.7% oil)	18	12	67	63
Oil emulsion (1.3% oil)	16	8	35	48
L.S.D. 19:1	10	6	10	9
99:1	14	8	14	14

(1) Grove No. 2: Lime sulfur-wettable sulfur in August in addition to July application.
(1) Grove No. 3: Lime sulfur-wettable sulfur applied in June in addition to July application, no August spray.
*No treatments.

Table III.
Severity of Greasy Spot After Sprays Containing Various Amounts of Basic Copper Sulfate

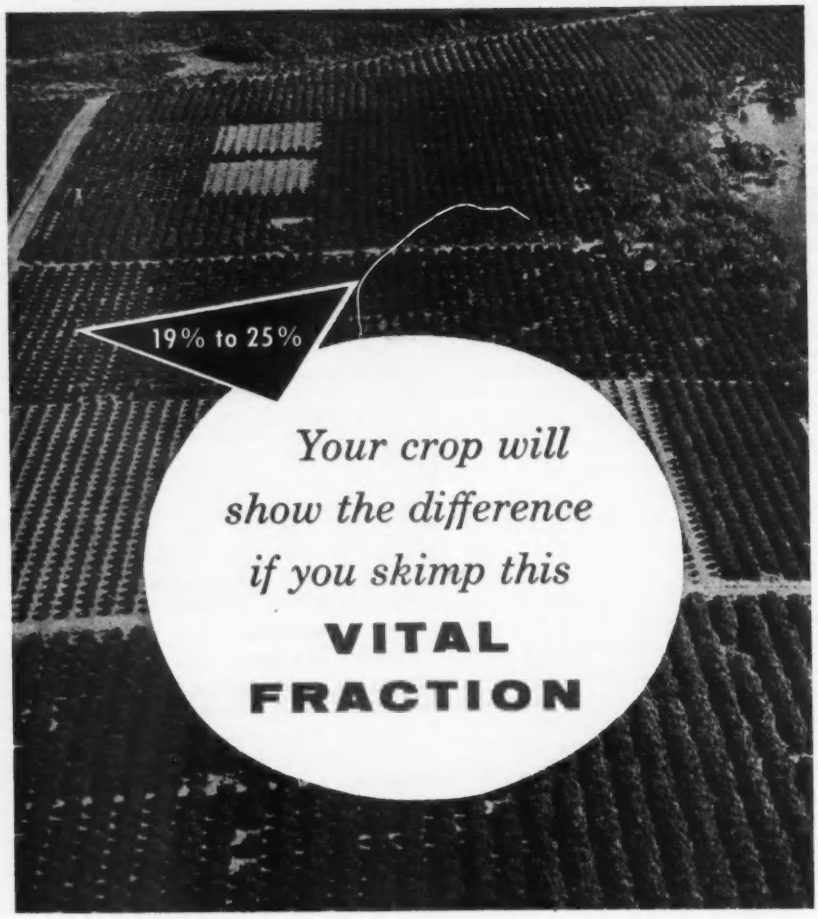
Amounts per 100 Gallons Basic Copper (53% Metallic)	Month Sprayed	Greasy Spot Rating Grove No. 1	Grove No. 2
Check		41	64
Basic copper 1.00 pounds	July	5	11
Basic copper 1.50 pounds	July	5	7
Basic copper 0.75 pounds	August	29	5
Basic copper 1.00 pounds	August	29	7
Basic copper 1.50 pounds	August	28	5
L.S.D. 19:1		10	6
99:1		14	8

Parathion and wettable sulfur were included in all sprays.

Table IV.
Effect of Time of Application of Copper Sprays on the Severity of Greasy Spot

Grove No. 1 Grapefruit Sprayed	Grove No. 1 Grapefruit Greasy Spot Rating	Grove No. 2 Grapefruit Sprayed	Grove No. 2 Grapefruit Greasy Spot Rating	Grove No. 3 Greasy Spot Rating Sprayed	Grapefruit	Oranges
June 10	4	June 15	43	*	*	*
July 14	5	July 6	7	July 15	28	32
August 17	28	August 4	5	August 11	42	50
	*	September 15	25	September 13	98	74
Checks	41	*	64	*	91	86
L.S.D. 19:1	10		6		10	9
99:1	14		8		14	14

Parathion and wettable sulfur included in all sprays.
* No treatment.



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equally effective in all cases. These results indicate that .4 to .5 pound of metallic copper equivalent is sufficient for greasy spot control.

Timing of sprays: It has not been determined under what condition leaves are most susceptible to greasy spot infection, but results of timing experiments would indicate that July is a critical month. In Table 4 is shown the severity of greasy spot in three different groves where the timing of copper sprays was varied. In Grove No. 1, a June 10 spray was as effective as one applied July 14, but in Grove No. 2, a June 15 application was not as effective as one made July 6. There is no explanation for the difference in severity of greasy spot between the two June-sprayed plots. The groves were not more than two miles apart. July copper applications were effective in all plots, but greasy spot in Grove No. 2 was less severe on January 25 where the copper application was made August 4, Table 5. In Grove No. 1 and Grove No. 3 the August applications were not as effective as those made during July. September applications in Grove No. 1 were more effective than those applied in June, but not effective enough to warrent treatment at that time. In Grove No. 3, the July copper application was the most effective, the August application less effective and the September application the least effective of the three.

There was a marked increase in severity of greasy spot in all plots between early December and late January in 1953-54 and 1954-55. In Table 5 is shown greasy spot severity on December 2 and January 25 following July 6 and August 4 sprays of parathion — wettable sulfur — basic copper. Greasy spot was less severe on January 25, 1955 where the copper spray was applied on August 4 than where it was applied on July 6. These data would indicate that a late July or early August application of a fungicide may be more effective than earlier applications in reducing the prevalence of greasy spot in February.

Greasy spot was significantly less severe on January 25 following a July 6 application of copper-oil than where copper-wettable sulfur was applied on the same date. However, July copper-oil is not recommended where the crop is to be sold for the fresh fruit market.

From these results it appears that treatments for greasy spot control should be made between June 20 and August 7.

Fruit Quality: Unfortunately, the

use of copper sprays in summer has definite limitations, especially on oranges, if the crop is to be sold as fresh fruit. As stated previously in this article, a copper spray is likely to accentuate any corky growth and cause it to turn dark brown or black. Star melanose on oranges is a common type of blemish where copper sprays have been delayed until the oranges have been infected with melanose. The margins around wind scars (mechanical injury) are also likely to be somewhat raised and dark in color. Oranges affected with blossom-end russeting are much rougher and darker in color on affected areas where copper has been applied. These facts were made clear when samples of fruit from the Hamlin orange grove (Grove No. 3) were inspected in the packing-house. An average of 35% of the fruit from copper-sprayed plots was affected with black-colored blossom-end russeting. Furthermore, the later in the summer the copper was applied, the higher the percentage of discolored fruit; in comparison, there was an average of only 12% of the brown or common type of blossom-end russeting in plots where no copper was applied. The higher percentage of blogsom-end resseting recorded from the copper-sprayed plots was probably due to the fact that a slight amount of blossom-end russeting was much more noticable on fruit sprayed with copper. Because of the discoloration there was a low grade of fruit in the copper-sprayed plots. Where copperwas applied, there was an average of 34% firgt grade fruit compared to 54% where it was omitted. At the present time, there is no known reason why oranges cannot be sprayed in the summer with copper if the crop is not to be sold in the fresh fruit market.

A summer copper-wettable sulfur spray on grapefruit did not lower the grade to any extent. Melanose lesions were somewhat darker on some fruit, but not dark enough to lower the grade. However, melanose lesions were somewhat enlarged and black in color where copper-oil was applied. A summer copper-oil combination is not recommended where any citrus crop is grown for the fresh fruit market.

Internal quality of Hamlin oranges was not affected by the addition of copper to the July parathion-wettable sulfur spray, Table 6. There was no significant difference in soluble solids, acid or vitamin C content of the juice where copper was included in the spray, Plot 4, than where it was omitted, Plot 2. However, in two of

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the three plots where parathion was combined with sulfur, soluble solids were higher than where 0.75% oil was used. Soluble solids were also higher in all parathion sprayed plots than where 1.3% oil was applied.

No analysis of grapefruit juice was made from any of the grapefruit experiments because of the irregularity of the bloom.

Effect of copper sprays on subsequent mite and scale infestations: A possible effect of summer sprays on subsequent purple mite, **Metatetranychus citri**, McG., and scale infestations should not be overlooked. In October of 1953, purple mites were more numerous in plots where copper was added to the August sulfur spray. In the 1954 experiments in Groves 1 and 2, counts in October showed no difference in the degree of infestation. On August 4, in Grove No. 1, where sprays were applied on July 6, 69% of the leaves were infested where copper was used as compared to 45% where copper was omitted, but by September 22 the mite population had decreased in all plots and there were no significant differences. In Grove No. 2, purple mites increased following the July application in all plots except the unsprayed check and a very heavy infestation had developed by September, but had decreased by November 4 in all plots regardless of treatment. Even though mites were no more numerous in the fall of 1954 where summer copper applications had been made, it is reasonable to expect that in some years heavier mite infestations may follow summer copper applications.

In October of 1954 a count of purple scale, **Lepidosaphes beckii** Newm., was made from leaves collected in some of the treated plots in Grove 2. The scale population was no higher in plots sprayed with parathion-wettable sulfur-neutral copper than where the copper was omitted. However, from past experiences it may also be expected that in some years purple scale may be more numerous following a summer copper. It should be noted that parathion or oil was included in all sprays where a summer copper application was made.

Suggested Experimental Spray Program: Due to greasy spot, some groves have lost a high percentage of leaves during each winter for two or more consecutive years and the trees are now in poor condition. It is in these groves that an experimental program can be tried. Next fall and winter, observations should be made of scale and mite populations and external appearence of fruit.

On grapefruit, especially groves that have a history of leaf drop caused by greasy spot, it is suggested that between July 1 and about August 7, a neutral copper be applied at a concentration of 0.4 to 0.5 of a pound of metallic copper per 100 gallons in the form of a neutral copper. The neutral copper can be combined with wettable sulfur and parathion. In groves that were not severely affected with greasy spot in 1954, an oil emulsion at 1.3% actual oil or 0.7% oil plus parathion can be applied during July. It is also suggested that during the summer when it is necessary to control rust mites, use one gallon of lime-sulfur plus five pounds of wettable sulfur. If it is necessary to spray groves with oil early in June or after the first of August, a wettable sulfur-copper application can be applied in July either three weeks after the June oil spray or three weeks before the August oil application. A copper-oil can be used on young non-bearing trees. Use approximately 0.4 pound of actual copper per 100 gallons in this combination. Make the application when there is a minimum amount of succulent growth, because copper may burn if it is applied during hot weather.

On oranges, a July oil or oil-parathion combination is recommended with lime-sulfur-wettable sulfur sprays for rust mite control during the summer. However, lime-sulfur should not be sprayed on Hamlins, Jaffas, Temples or tangerines after June. If an orange crop is to be processed and external appearance is no factor, a July copper-wettable sulfur can be used. A July copper spray can also be used on young trees where the fruit is destined for the canning plant.

Table V.
Severity of Greasy Spot Following Summer Scalicidal and Fungicidal Sprays

Scalicides and Supplements Fungicides in amounts per 100 gallons.	Greasy Spot Rating			
	Sprayed July 6		Sprayed August 4	
	Sampled		Sampled	
	Dec. 2	Jan. 25	Dec. 2	Jan. 25
Parathion, wettable sulfur, basic copper sulfate 1.5 lbs	7	22	5	11
Parathion, wettable sulfur, basic copper sulfate 1.0 lbs.	11	23	3	9
Parathion, wettable sulfur, basic copper sulfate 0.75 lbs	*	*	5	8
Parathion, wettable sulfur — — — —	39	62	45	62
Parathion, wettable sulfur, zerlate 2 lbs.	30	51	*	*
Parathion, wettable sulfur, captan 2 lbs.	25	43	32	44
Parathion, wettable sulfur, captan 2 lbs. (July & August (1)	9	18	*	*
Parathion, oil emulsion 0.65%	12	35	*	*
Oil emulsion 1.3%, basic copper 1 lb.	5	11	*	*
Oil emulsion 1.3%	8	20	*	*
Check no treatment	64	91	64	91
L.S.D. 19:1	10	8	10	8
99:1	14	11	14	11

(1) Parathion omitted in August wettable sulfur-captan application.
* No treatment

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3. Rhodes, Arthur S. and E. F. De-

(Continued on Page 14)

Table VI.
Effect of July 15 Sprays on Internal Fruit Quality of Hamlin Oranges. Grove No. 3*

Plots	Amounts of Materials per 100 Gallons	Percent soluble solids	Percent titratable acid	Ratio Brix acid	Vit. C mgs./ 100 ml. juice
1	No treatments	8.54	.87	9.99	61.9
2	Parathion 1.66 lbs., wettable sulfur 10 lbs.	9.15	.94	9.94	65.9
3	Parathion 1.66 lbs., wettable sulfur 10 lbs., lime-sulfur 1 gal.	8.86	.90	10.02	63.6
4	Parathion 1.66 lbs., wettable sulfur 10 lbs., basic copper 1.5 lbs	9.09	.93	10.03	65.7
5	Parathion 1 lb. oil emulsion (0.7% actual oil)	8.88	.90	10.02	64.2
6	Oil emulsion (1.3% oil)	8.70	.87	10.23	62.0
	L.S.D. 19:1	.197	.033	.051	2.328
	99:1	.261	.044	.067	3.082

*Data represent an average of four samples taken on September 16, September 28, October 12 and November 2, 1954, orange size 250.

New Miticides For The Citrus Red Mite (Purple Mite)

— By —
HERBERT SPENCER AND
ALLEN G. SELHIME

Reprinted from the Proceedings of the Florida State Horticultural Society Miami Beach, October 20, 21, & 22, 1954.

The citrus red mite (Metatetranychus ciri (McG.)), also known as the purple mite and the red spider, has become more prevalent and destructive in the last 8 or 10 years. Heavy infestations are now apt to develop in the spring, and even in the summer and fall.

Our research on control of the citrus red mite dates back to 1937, when experiments demonstrated that oil-emulsion spray was effective and that lime-sulphur plus wettable sulphur was ineffective when applied in June. In 1944 dinitro-ortho-cresol gave no control, but dinitro-ortho-cyclohexyl phenol was excellent (2). Both oil-emulsion and dinitro sprays are still recommended in the spray schedule (1) and are widely used, but they have limitations. Oil emulsion may cause defoliation in very cold or very dry weather, cannot be combined with the regular sulphur sprays, and if used after July may retard maturity and coloring of the fruit. The dinitro compounds may cause spray burn in the warmer months. We need miticides that are effective and safe at all times of the year, and that can be added to combination sprays containing copper, wettable sulphur, and minor-element nutritional chemicals.

Among 17 materials tested between 1945 and 1952, DDT, TEPP, and parathion brought about increases of citrus red mites (4); Metacide, chlordane, and lorol-2-thiazolinyl sulfide gave no control; 2-capryl-4, 6-dinitrophenyl crotonate (Karathane, Arathane), azobenzene, R-242, and compound 923 gave some control, but were not made available commercially; and bis (p-chlorophenoxy) methane (Neotran), p-chlorophenyl p-chlorobenzenesulfonate (Ovex, Ovotran), Aramite, EPN, and malathion were consistently effective over several years. Neotran, Ovotran, and Aramite have been recommended in the spray schedules, and the last two are still being tested. Results with these experimental miticides covering work through 1952 have been published (2, 3, 5, 6).

In 1953 nine spray mixtures were compared. They were applied on March 2 to Temple orange trees at Fort Pierce, Fla. The spray mixtures and data on control are given in table 1.

Protection from Ovotran plus parathion, oil emulsion, EPN plus parathion, demeton, and schradan lasted through the rest of the year, at least 283 days. Protection from Aramite plus parathion lasted 71 days. The other treatments controlled red mites for only 37 days and allowed a heavy summer infestation to develop.

In 1954 all trees were sprayed on April 16-20 with nutritional materials including copper, zinc, and manganese. Fifty of these trees received parathion and wettable sulfur in this spray, 10 had oil emulsion, 10 emulsive malathion plus wettable sulfur, 10 demeton plus the sulfur, and the remaining 10 schradan plus wettable sulfur. The experimental miticides were omitted because citrus red mite infestations were low, not more than 2 to 5 percent on the leaves. After the treatment, red mite infestations developed rapidly, and by May 26 had reached 49 to 60 percent in the trees that had received parathion. Emulsive malathion and schradan allowed almost as heavy a build-up, but there was none on trees that had received demeton or oil emulsion.

On June 7 experimental miticides were applied to the trees in the treatments that had high infestations. The miticides were Ovotran, EPN, Mitox (20-percent p-chlorobenzyl p-chlorophenyl sulfide, Isolan (25-percent 1-isopropyl-3-methyl-5-pyrazolyl dimethylcarbamate), malathion wettable,

(Continued on Page 17)

(1)Entomology Research Branch, Agricultural Research Service, U. S. D. A., Orlando, Fla. Raymond E. Nute assisted in the grove samplings. Norman G. Platts was the grower-cooperator.

Table I.
Effectiveness against the citrus red mite of various spray mixtures containing miticides, applied March 2, 1953.

Miticides in Spray (Quantities per 100 Gallons of Water)	Percent of Leaves Infested					
	Feb 3	March 12	April 8	May 12	July 7	Dec. 10
Ovotran(50% WP) 1 lb. 1/	50	0.5	1.5	14.0	7.0	10.0
EPN (27% WP) 1 lb. 1/	51	0	2.0	15.0	6.5	-
Aramite (57% Em) 1 qt. 1/	39	1.0	5.5	28.0	6.0	-
Chlorobenzilate (25% Em) 1 pt. 2/	46	1.5	15.5	47.0	4.0	14.5
Malathion (25% WP) 2½ lb. 2/	28	5.0	27.5	50.3	2.0	8.0
Malathion (50% Em) 1 qt. 2/	35	5.0	17.0	47.0	5.5	5.0
Emulsive Oil (90% Em) ½ gal. 3/	59	1.0	1.5	13.3	7.5	10.5
Demeton (Systox 21.2% Em 1 pt.	53	1.5	0	10.0	18.0	9.5
Schradan (70% Em)	52	6.0	2.0	5.6	16.5	6.5
Difference required for significance at 5% level	15	4.0	7.0	9.6	7.4	nsd
at 1% level	20	5.5	9.0	13.0	10.0	nsd

1/ In combination with wettable sulfur (90% WP) 5 lb. plus parathion (15% WP) 1 lb.
2/ Combined with wettable sulfur (90% WP) 5 lb.
3/ Combined with parathion (15% WP) 1 lb.

Table II.
Effectiveness of Various Miticides Against the Citrus Red Mite in 1954

Miticide (Quantity per 100 Gallons)	Spray Dates				Percent of Leaves Infested			
	April 16-20	June 7	July 26	April 12	May 26	July 21	August 13	September 16
Ovotran (50% WP) 1 lb.	-	x	x	3	59	38	0.33	17
Emulsive oil (90% Em) 1 gal.	x	-	x	3	8	70	0.33	10
EPN (25% WP) 1 lb.	-	x	x	4	58	32	0	16
Mitox (20% WP) 2 lb.	-	x	x	3	60	49	0	16
Isolan (25% Em) 1 pt.	-	x	x	5	55	63	3	28
Malathion (25% WP) 2½ lb.	-	x	x	2	49	62	3	26
Malathion (50% Em) 1 qt.	x	x	x	3	43	58	1.66	21
Demeton (Systox 21.2% Em) 1 qt.	x	-	x	4	5	56	0	22
Schradan (70% Em) 1 qt.	x	x	x	2	36	52	0	0
Difference required for significance at 5% level					14.3	11	1.96	9
at 1% level					19	5	2.65	12

AMERICAN Cyanamid COMPANY'S
NEWS-TELLER

PARATHION AND OIL COMBINATION PROVED TO BE EXCELLENT SCALICIDE AND MITICIDE FOR CITRUS

MANY growers erroneously believe mite infestations build up faster following parathion applications to citrus. Actually, research* has shown parathion has little or no effect on incidence of mite infestations. It has been shown that purple mite infestations are likely to be more numerous following sprays containing compounds of zinc, copper and sulfur, than where no spray has been applied. Repeated applications of sulfur are probably more responsible for subsequent infestations of the purple mite than any other one factor. Since it is necessary to apply sulfur for control of rust mites and no substitute for sulfur has been found, there seems to be no good answer at present for this particular problem. There are cases, however, where amounts of sulfur applied can be decreased, and any reduction will be helpful.

Research* has shown a mixture of oil emulsion and parathion is effective for combined control of purple mites and scale insects. The combination of about 0.65 per cent actual oil plus 1 pound of parathion (15 per cent) has resulted in very good scale control and fairly good purple mite control. Unfortunately, the combination of 0.65 per cent actual oil and parathion adversely affects soluble solids as does a straight 1.3 per cent oil, *but to a lesser extent.* One of the reasons for not using oil is because it has an adverse effect on soluble solids and vitamin C content of juice. However, if the same precautions are taken in timing oil-parathion sprays as with the regular 1.3 per cent oil emulsion, excellent control of scales and purple mites should result *with less effect on solids.*

Parathion used alone or in combination with copper, sulfur and the nutritionals still offers the grower the most versatile and effective insecticide for citrus. It may be combined with most materials used on citrus, including lime-sulfur solution. It may be used at any time during the year with less shock to trees, less leaf drop and less dead wood. Soluble solids and vitamin C content of juice is not affected when parathion is used, and it does not retard degreening.

**The Status of the Purple Mite and Its Control,* Proceedings of the Florida State Horticultural Society, 1954.

XUM

Whether using parathion alone or in combination with oil or other materials, insist it be formulated from American Cyanamid Company's Thiophos® Parathion Technical

When THIOPHOS Parathion was made available for testing against citrus insects, American Cyanamid Company immediately set up an extensive research program on parathion in cooperation with federal, state, county and industry research groups. This program was formulated to study the effectiveness of parathion against citrus insect pests and to study safe, effective methods of applying parathion to citrus.

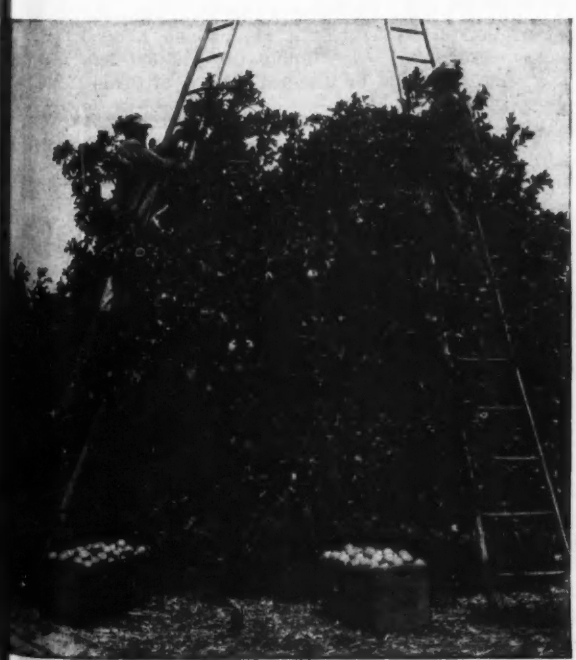
Many felt that parathion, if properly handled, would give the citrus grower insect control at any time he needed it without causing tree or fruit injury. An insecticide of this type was a great demand and badly needed by the growers of this state. Much time, effort and expense was put into the program, with the research groups mentioned above doing most of the research and contributing greatly to the success of the program. Through this effort, parathion was found to be most effective against certain insect pests of citrus and a safe, effective method of application was devised. Now, each year, millions of pounds of parathion are used to control citrus insect pests as well as many insect pests of ornamentals, fruit, vegetable and forage crops.

Recommendations for the use of parathion, including dosage requirements, timing of applications and safety precautions to follow in its application, can be found in various experiment station publications, on the manufacturer's label, and in the *Parathion Growers' Handbook* published by American Cyanamid Company. Growers should remember these recommendations are the result of much carefully planned research. If the best results are to be had with parathion, such recommendations should be followed carefully.

There are a number of good liquid and wettable powder formulations available from insecticide formulators throughout the area. Choose the one that fits into your particular spray program best, and insist that it contain American Cyanamid Company's THIOPHOS Parathion Technical.

Malathion proves to be effective insecticide for citrus

American Cyanamid Company's new insecticide MALATHION, can be used effectively as a scalicide on citrus. Information to date indicates that scale can be effectively controlled with 3 to 5 pounds of 25 per cent wettable powder or 1 to 2 pints of 57 per cent emulsifiable liquid per 100 gallons of spray. Although malathion is an organic phosphate compound, it is much less toxic to warm-blooded animals than most materials of this type. In fact, it is over 100 times less toxic than parathion and has been described by the USDA as one of the safest insecticides to handle. Malathion, like parathion, is a very versatile material. It can be used at any time and can be combined with most commonly used spray materials. It has proved most useful on door yard plantings of citrus and in situations where it is impractical to use parathion or oil.



Spray crews should be briefed on safety precautions

Spray crews handling parathion and other toxic materials should be continually reminded of the precautions they must follow to insure their safety. After prolonged periods of handling materials they are likely to become careless and feel they are immune to the toxic properties. Employers should see that proper equipment be furnished each man. Blood tests should be made regularly to determine cholinesterase levels, especially if workers are to be handling parathion over long periods of time. Laboratories have been established throughout the citrus belt for your convenient use.

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Walker Memorial Hospital
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West Orange Memorial Hospital
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Dr. Millard B. White
Physicians Medical Laboratory
Van Skike Building
Sarasota, Florida

Dr. Williams
Clinical Laboratory
Morrell Memorial Hospital
Lakeland, Florida

Safety precautions are simple to follow. Consult your Citrus Experiment Station, your supplier of parathion insecticides or American Cyanamid Company for details concerning your particular spray program, and remember—SAFETY IS FREE —USE IT GENEROUSLY.

AMERICAN Cyanamid COMPANY
MANUFACTURER OF
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BREWSTER, FLORIDA

Citrus And Subtropical Fruits Institute, Lake Placid, June 8-9

The second annual Citrus and Sub-Tropical Fruits Institute will be held at the New 4-H Club Camp near Lake Placid on June 8 and 9 according to announcement by Dr. Fred P. Lawrence, Extension Citriculturists, Agricultural Extension Service, University of Florida.

Papers and talks on almost every topic of interest to Florida citrus growers and other horticulturists will

DR. FRED P. LAWRENCE

be delivered by men of note in the horticultural field, including members of the faculty of the Citrus Experiment Station of Lake Alfred and workers in the Agricultural Extension Service at the University of Florida.

The first of these Institutes was held last year and proved of great interest to horticulturists. The program as announced by Dr. Lawrence indicates that the Institute this year will be of even greater interest and value to everyone interested in any way to Florida's horticultural development.

Cooperating in the program are the Florida Citrus Production Credit Association, Florida Citrus Mutual, Ridge Lime and Avocado Growers Association and Superior Fertilizer Company.

Sleeping accommodations are provided in twelve cabins, six for men and six for women, without charge for those who desire to remain on the grounds during the progress of the program. Sleeping accommodations are also available at nearby motor courts and hotels in Sebring and Lake Placid.

Dr. Walter Reuther

formerly Principal Horticulturist U. S. D. A., Fruit Station, Orlando, now heads Horticultural Department University of Florida. He heads all teaching, research and extension work at the University.

GREASY SPOT CONTROL

(Continued from Page 10)

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$1,756,300 Voted By Florida To Fight Spreading Decline

A bill appropriating funds to fight the spreading decline disease which is menacing Florida's citrus industry cleared the legislature with unanimous house passage and went to Gov. LeRoy Collins.

The measure appropriates $1,756,300 to be spent by the State Plant Board and $90,800 to be spent by the citrus experiment station on treatment and research. An estimated 6000 acres of groves are now infested with the burrowing nematodes, which cause the disease by destroying the feeder roots of citrus trees.

Rep. Perry Murray of Polk County said 40,000 acres will be infested in 10 years, if the disease is unchecked and the citrus industry will by then have suffered a $200,000,000 loss.

Citrus leaders are hopeful that this fund may be augmented by Federal funds for fighting this menace which threatens Florida citrus groves.

Frank Beale Borries, Jr., has become associate editor with the University of Florida Agricultural Experiment Station and Extension Service, filling the position left vacant by the death Feb. 1 of Clyde Beale.

TREE LIFE

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Fifield Will Head State University Agricultural Work

Willard M. Fifield will become provost for agriculture at the University of Florida June 1, succeeding Dr. J. Wayne Reitz, who was made president of the University on April 1.

His appointment as chief administrative officer for agriculture and forestry at the University was recommended by President Reitz and approved by the State Board of Control. In his new capacity he will coordinate the work of the College of Agricultural, School of Forestry, Agricultural Experiment Stations and Agricultural Extension Service.

Mr. Fifield has been director of the Agricultural Experiment Stations since March 1, 1950, and was assistant director from July 1, 1941. He joined the Station staff as student assistant in 1929, became graduate assistant in 1930, and was made assistant horticulturist at the Sub-Tropical Station, Homestead, in 1932.

From March 8, 1942, to December 31, 1945, he was on military leave with the U. S. Air Force, from which he was separated as a lieutenant colonel. He served at Miami Beach and was director of training and assistant commandant of students at two fields in Texas and commandant of cadets at an Oklahoma field.

The new provost was vice-president of the senior class at the University of Florida in 1930, the year he was awarded his bachelor's degree by the College of Agriculture. He obtained his master's degree in 1932.

A leading figure in campus activities, Mr. Fifield was president of Alpha Zeta, honory agricultural fraternity, first editor of Florida College Farmer, president of the Agricultural Club, and president of Delta Tau Delta social fraternity.

In scientific circles he has been honored by election as a fellow of the American Association for the Advancement of Science.

The new provost is well known throughout Florida, in civic, scientific and agricultural circles. He is past president of Rotary Clubs at Homestead and Gainesville and of the Gainesville Chapter, Reserve Officers' Association. He is a member of the Soil Science Society of Florida and has been a member of the State Horticultural Society for 26 years.

During his active research career he was a member of the American

WILLIAM M. FIFIELD

Society for Horticultural Science, Potato Association of America and Florida Academy of Sciences.

For the past year Mr. Fifield has been chairman of the group of 13 Southern experiment station directors and vice-president of the Association of Southern Agricultural Workers. Last year he was chairman of the Committee of Nine experiment station directors throughout the country who coordinate regional research projects at the various state experiment stasions.

He and Mrs. Fifield are members of the Presbyterian Church.

CITRUS INSECT CONTROL FOR JUNE 1955

(Continued from Page 3)

after spraying with oil. Wettable sulfur should be used at 5 pounds per 100 gallons in parathion sprays, but 10 pounds is necessary where sulfur is used alone. Lime sulfur at 1 gallon per 100 gallons of water is very effective against rust mites and may be used with parathion either supplemental with additional sulfur or alone. However, until further information is available, lime-sulfur and parathion should not be used together in concentrated sprays.

Greasy Spot Control: For the latest information on greasy spot see **Greasy Spot Control** in this magazine.

For more detailed information refer to the 1955 "Better Fruit Program" or consult the Citrus Experiment Station at Lake Alfred or Fort Pierce.

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Many years a favorite source of soluble magnesia for Florida soils. Used extensively in fertilizer mixtures for citrus crops and vegetables. Especially useful and economical for direct application where only magnesia is required.

Florida growers now consider magnesium a primary plant food in the same category with nitrogen, phosphorus and potash.

The recommendations of the Flordia Citrus Experiment Station at Lake Alfred, published in January 1954, stress the need for large application of magnesium for Citrus in soluble form and state that it is usually applied as a Sulphate.

Ask your fertilizer manufacturer for EMJEO, long a dependable source of this key plant food.

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Citrus Advisory Committee Urges More Research

At it's annual meeting in Washington, March 21-23, USDA's Citrus Fruit Research and Marketing Advisory Committee stressed the need for an expanding research program on citrus to keep pace with programs facing the industry. The Committee urged also that plant-quarantine work at the country's borders be greatly strengthened to prevent entrance of dangerous insects and diseases from abroad. Other recommendations of the group emphasized the need to reduce marketing costs in getting high-quality citrus products to consumers.

This advisory committee is one of several such groups established under the Research and Marketing Act of 1946 to help guide Department of Agriculture research, service and education activities. It's members represent all the major producing areas and sectors of the citurs industry.

Among recommendations given top priority by the committee at this year's meeting are:

Production Research: (1) Expanded work on "spreading decline" — a serious disease of citrus trees. (2) Expansion of all phases of the research program on the Mexican fruit fly, a destructive pest now present in Mexico.

Utilization Research: (1) Expanded research on the relationship of color to maturity in colored grapefruit; preparation and maintenance of quality in pulpfortified pink and red grapefruit juice and concentrates; utilization of "faded colored grapefruit; and development of new or improved grapefruit products from all of this fruit. (2) Chemical and physical investigations to develop an improved basis for maturity standards and greater uniformity in fruit quality of oranges for processing and fresh market.

Marketing Research: (1) Expanded work on chemical control of decay in citrus fruits during storage and transit. (2) Expanded research on precooling and in-transit refrigeration of citrus friuts and frozen citrus concentrates.

Service Work by USDA: (1) Expanded work on development and revision of U. S. standards for grades of processed citrus products, with particular attention to development of grade standards for new products, and testing and evaluation of objective methods for measuring quality factors in citrus products as a part of official inspection procedures. (2) Initiation of complete citrus-tree surveys, by ages and varieties, in Texas and Arizona.

Service and Education Work by State Departments of Agriculture and Extension Agencies: Expansion of service work undertaken on a matched fund basis by State departments of agriculture, and of marketing educational work by Federal-State cooperative extension services.

Committee members attending the meeting were: Chairman F. R. Wilcox, Sunkist Growers, Inc., Los Angles, Calif.; A. L. Chandler, Mutual Orange Distributors, Redlands, Calif.; James Cooke, Penn Fruit Co., Inc., Philadelphia, Pa.; S. B. Crockett, Harling, Texas; H. Etchison, McAllen Fruit & Vegetable Co., McAllen, Texas; L. S. Hamme, Texsun Citrus Exchange, Weslaco, Texas; J. W. Reitz, University of Florida, Gainesville, Fla.; R. D. Robinson, Minute Maid Groves Corporation, Orlando, Fla.; A. V. Saurman, Pinellas Growers Association, Clearwater, Fla.; P. S. Twombly, Golden Citrus Juices, Inc., Fullerton, Calif.

Executive secretary of the committee is Dr. Roy Magruder of USDA's Agricultural Research Service.

DECISION ON AVOCADO MARKETING PROGRAM

Approval of amendments to the marketing agreement and order regulating the handling of avocados grown in south Florida, subject to industry acceptance, was announced recently by the U. S. Department of Agriculture.

The principal amendments would (1) provide for establishment of marketing research and development projects; (2) provide for the fixing of the size, weight, or pack of containers used in the packaging and shipment of avocados; (3) include the counties of Orange and Lake in the production area; and (4) make regulations applicable to all export shipments.

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Plans For U. S. Exhibit At Cologne Food Fair

The U. S. Department of Agriculture has outlined detailed plans for the United States food exhibit at the International Food Fair in Cologne, Germany, October 1 to 9, 1955, to be sponsored jointly by U. S. agricultural trade groups and the USDA.

The exhibit, first announced May 5, is designed to help step up the sales promotion of U. S. food and related products abroad and is open to participation by private U. S. exhibitors interested in developing new and broader markets for their products overseas.

Under the plans, the U. S. Department of Agriculture will provide the space and serve as organizing agent for the exhibit. Private trade groups will provide the commodity displays and the personnel to man them, bearing all costs incurred other than for the exhibit space.

Priority for space will go first to trade associations and then to individual firms, in order that the exhibit represent as broad a cross section of U. S. food interests as possible. Interested parties are urged to submit their requests for space as soon as possible, accompained by rough plans of the proposed display and an indication of the amount of space desired. Such requests will be accepted until June 17.

The Department has reserved approximately 6,456 square feet of space in the Fair's Hall of Nations for U. S. participation. Exhibit units will be available, singly or in multiple, in a size approximately 20 feet in length and 15 feet in depth. Applications for smaller exhibit areas, however, also will be given consideration.

Shipments of displays from New York by mid-August will provide a period of about two weeks for erecting the exhibit in Cologne.

NEW MITICIDES FOR THE CITRUS RED MITE (PURPLE MITE)

(Continued from Page 11)

emulsive malathion, and schradan. Heavy rains totaling 10.54 inches during the next 60 days shortened the protection from these sprays, but Ovotran and EPN were superior to the others.

All these miticides were reapplied on July 26, with good control. On August 13 no mites could be found on trees sprayed with EPN, Mitox, demeton, or schradan. The trees sprayed with Ovotran or oil had less than 1 percent, with emulsive malathion less than 2 percent, and with wettable malathion and Isolan 3 percent infestation. During this period infestations were declining naturally. In the examinations made September 16, infestations had increased in all treatments except schradan.

Among the miticides tested in combination sprays during 1953 and 1954, the newer materials Mitox, Isolan, demeton, and schradan controlled citrus red mites as well as did oil emulsion, Ovotran, Aramite, or EPN. Malathion was also satisfactory for control when used twice during the year.

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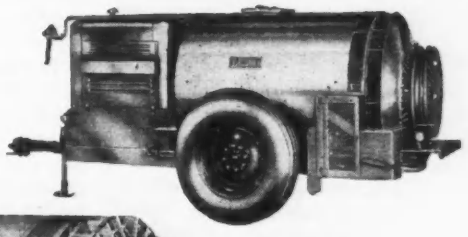

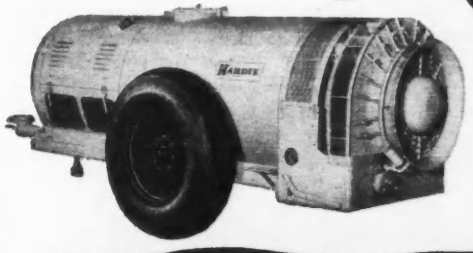

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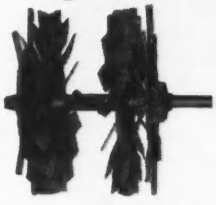

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Organic Farming With Chemical Fertilizers

Continued from April Issue

RICHARD BRADFIELD

Since all available evidence seems to indicate that a ton of fresh organic matter is much more effective on crops than equal weight of dry matter in the form of humified organic matter, it would appear that primary emphasis should be placed on having fresh organic material in the form of manure or crop residue available for turning under each time the soil is plowed, instead of on the changes in the total content of organic matter in the soil. I subscribe wholeheartedly to the conclusion reached by Professor M. F. Miller in his study of this subject (3, p. 26): "In general, the conclusion has been reached that it is uneconomical under the climatic conditions existing in Missouri and under the usual systems of cropping and fertilization, to increase very greatly the nitrogen content of the average soil above what it is today. This, however, need not be a matter of great concern so long as reasonably large amounts of organic matter, particularly that from legume crops, are regularly returned to the soil. The important thing, from the standpoint of continued crop production, is to provide, from rotation to rotation, or year to year, a regular and abundant supply of readily decomposable organic matter that is reasonably high in nitrogen. The decay of this within the soil will set free sufficient available nitrogen for satisfactory crop yields. In other words, it is the decomposition of these regular and abundant additions of organic matter, largely from legumes, that is important, although the accumulation of a large nitrogen reserve within the soil would be advantageous."

Work like that reviewed from Rhode Island indicates that we must be prepared in the future to go even beyond the philosophy expressed by Professor Miller. We must be in position to take maximum advantage of the specific decomposition products derived from certain types of crop residues in order to take full advantage of the potentialeis of organic matter in soil management. To this end, we should emphasize in the classroom and in our publications the fact that soil organic matter is complex, that it has diverse effects, that the farmer can control, to a certain extent, some of these organic matter transformations which are of agricultural significance. We must no longer think of organic matter in the soil as an entity, or something to be maintained at a certain level, but as something which catalyzes certain types of activities within the soil and is itself decomposed in the process. We must stress the importance of the rate of "turn over" of organic matter in the soil. I do not want to minimize its importance as the form in which most of the nitrogen and much of the more available phosphorus is stored in the soil, stored in such a form that its release microbiological processes tends to be synchronized with the needs of the crop. But we must remember that the rate of release from 1 ton of fresh organic residues of appropriate type may be as great as from 20 or more tons of humified material. I am inclined to feel that if a farmer would provide ample fresh organic matter frequently in his rotations he would not need to worry about the resultant slight fluctuations in the total organic matter content of the soil. Our biggest opportunity for service, as soil scientists, in this area is to learn how best to produce the types of organic residues needed in any crop sequence and how to manage them so that the maximum returns will be obtained from their use. On most soils the amount of fresh organic matter needed for optimum yields cannot be produced without the liberal use of commercial fertilizers. Nor, on most soils can the most profitable returns from commercial fertilizer be obtained without these organic residues. For the highest type of agriculture it is not a question of organic or chemical fertilizers; both are essential and as inseparable as Siamese twins.

The problem of soil organic matter maintenance varies with the nature of the soil, the climate, the type of crops grown, and the way in which the crop is marketed. Consequently, it assumes very different forms and receives different emphasis in different sections of the country. Most of the evidence which I have cited above on the maintenance of organic matter in soils has been derived from experiments conducted in the Corn Belt. The experiment stations of that area have been more concerned with the problem throughout their history than the stations in any other section of the country. I wonder why? I am inclined to think it is because the maintenance of soil organic matter has been more feasible there than in any other section of the country. It is a general livestock type of farming area. A high proportion of the crops grown are marketed in the form of livestock products. The cheap production of livestock, especially of cattle and sheep, calls for the use of forage crops, sod-forming perennial legumes which we have found to be so effective in building soil structure and maintaining soil organic matter. Livestock production means, also, that about 80 percent of the nutrients removed from the soil in crop production can be circulated back to the

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soil in the form of animal manures.

In the dairy farming sections of the Northwest and of Wisconsin and Minnesota, the situation is very similar and, in the Northwest, even more favorable for the maintenance of the organic matter content and general productivity of the soil because even a higher proportion of the land is in grass and a high proportion of the concentrates fed are imported from the west. The northeastern dairy farmer has for a half century been building up the fertility of his soil at the expense of those in the west. This is even more true of the poultry farmer in the Northeast whose business is built up almost exclusively upon important concentrates. The one exception is the truck farmers, using this term in its broadest sense to include potato and vegetable crops, who formerly depended upon commercial supplies of manure, but now depend largely upon the liberal use of commercial fertilizers and the growing of cover crops. Large areas of the poorer soils in the Northwest have been abandoned. In New York State alone nine million acres have passed out of farming since 1900.

In the West, until comparatively recently, water has been the all important factor in crop production. Farmers in that area have not been seriously concerned with soil fertility problems in general nor organic matter maintenance in particular.

In the South, the situation is quite different. In the first place, the soils of the South, as a general rule, were not as fertile originally as those in the Corn Belt or in the Wheat Belt. Most of the farms were smaller than in the other areas. The livestock industry was not highly developed in the region as a whole. Hence, the acreage of perennial forage crops was small, and but little animal manure was produced. The soils were not protected by a blanket of snow during the winter, and the crops grown were largely intertilled cash crops like cotton, peanuts, and tobacco. As a result, farmers in this section came to use commercial mixed fertilizer more regularly and more liberally than the farmers in any other section of the country. With this system of farming, organic matter maintenance was much more difficult. Soil structures tended to decline; erosion became a serious problem. Such, in brief, was the situation for the first 50 to 75 years after our agricultural experiment stations were established.

Let us review briefly now the fertilizer situation during this same period, or preferably prior to 1930. The supply of commercial nitrogen was relatively small and it was expensive Much of it was imported from Chile. We used some by-product ammonia and were beginning to import some synthetic nitrogen from Germany. We were dependent almost exclusively upon Germany and France for our posash supply. The price reached astronomic proportions during World War I. Superphosphate was the most universally used commercial fertilizer, and in many sections was the only commercial fertilizer with which farmers were familiar. In many sections of the Northeast even today farmers refer to commercial fertilizers as "phosphate." Both nitrogen and potash were more expensive relative to the price of crops than at the present time. Nitrogen, for example, throughout much of this period cost between 20 and 25 cents a pound, while corn was worth 50 cents a bushel. At this price relationship, if the nitrogen was used with the usual efficiency, it would produce just enough corn to pay for itself. Under such circumstances the farmer had little to gain by its use.

Let us now contrast this situation with that existing in 1954. The supply of all of these fertilizer materials is abundant. I understand that even nitrogen promises to be reasonably abundant. The potash industry has risen from negligible proportions to a giant capable of meeting all of our present day needs, and the production of superphosphate has been greatly expanded. The ratio of the price of fertilizers to agricultural products is much more favorable than in the earlier period discussed above. Nitrogen can now be purchased in many places for 10 cents a pound; corn is worth $1.50 a bushel. In other words, a bushel of corn will buy 15 pounds of nitrogen instead of two, as in the earlier period. As a result of all this, farmers are greatly tempted to use more ferti-

(Continued on Page 22)

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Reports Of Our Field Men . . .

WEST HILLSBOROUGH AND PINELLAS COUNTIES

J. A. Hoffman

On May 16th scattered showers broke up one of the longest dry spells in this section in some time. In some sections, growers have reported as much as two inches of rainfall by this time May 18th while others have reported from three-fourths of an inch to none. In unirrigated groves dry weather has caused a lot of fruit drop especially on early varieties. Dry weather has delayed the summer application of fertilizer. Growers are waiting to be sure that there will be sufficient moisture to tide them over until the rainy season.

A large portion of the Valencia crop remains unpicked in this area. Valencia price is off some and moving very slowly at the present time. There appears to be a good setting of Valencias for next year, Hamlin are very light.

NORTH CENTRAL FLORIDA

V. E. Bourland

We are having hot, dry weather, most all groves that can irrigate are very busy doing so, and where they have young trees they are trying to save them, but all are showing wilt. All old fruit is soft, and young going on the ground very bad, looks now as if we will have a short crop for next year, however most growers are expectinga June bloom as trees are getting such a shock by dry weather. Growers are at a loss about fertilizing, and plan to wait for a rain before doing much more.

SOUTHWEST FLORIDA

Eaves Allison

"At this time — May 16th — conditions in these here parts are getting as dry as a pismire's nest. Just driving an automobile along a piece of bare or cultivated ground will raise a cloud of dust as thick as smoke from a 'light-'ud'fire, and if you see a destroyer laying a smoke screen out across a grove somewhere don't worry, it's just a tractor pulling a harrow. Hit's downright dry!

Irrigation plants are going full blast and generally speaking most groves are standing the dry spell remarkably well. In some few cases young trees are dead and dying in spots where they cannot get enough water, such as white sand soak scrub spots, etc. This dry spell will of course have it's effect on reducing next year's crop. And on top of that there is a definite lack of fruit on some groves and parts of groves where the last freezing cold winds and late frosts did something to the bloom.

SOUTH POLK, HIGHLANDS, HARDEE AND DESOTO COUNTIES

C. R. Wingfield

Since May 15th we have had rains that have brought some relief to drought stricken areas.

Some areas are still in distress but with the rains having started we feel sure it will not be long before it will fully cover these counties.

The Summer application of fertilizer has been somewhat delayed because of drought but it will be stepped up where moisture is satisfactory.

The drought has brought about a weakened tree condition and there has been a heavy drop of new fruit. Generally speaking the early and mid-season fruit was light from the start, however, if the rains continue we will most likely have a late bloom which could change the crop estimate tremendously.

EAST HILLSBOROUGH AND PASCO COUNTIES

E. A. McCartney

A few spotty showers last month was very little help to the growers — all growers — citrus, vegetable and melons. Hail also did considerable damage in spots.

The damage by six spotted mites to citrus trees was the worse I have seen. Most growers sprayed for this condition but many small acreage groves of which there are many did not spray. They were hurt the worst. We have had a few good rains the past week and now everyone wants their fertilizer right now. We are doing our best to take care of them. There has been considerable dropping of young fruit all through the dry spell — quite heavy in some groves. This is good size fruit that with just a little rain would have been saved. I saw in today's paper where Citrus Mutual is bringing an expert from California to give them the correct estimate in boxes, sizes and all the dope on next years crop. Thats fine now and the growers can quit worrying about that and concentrate on trying to get a decent price for their fruit — especially grapefruit as there is a good crop of grapefruit set. Valencias also have a better set of new fruit than early and mid season oranges in this section. I wish some one would come up with the reason for that condition. As valencias carry their fruit all the year round it seems as though that situation should be reversed.

HIGHLANDS AND POLK

J. K. Enzor, Jr. & R. E. Lasseter, Jr.

Most groves in Polk County by the middle of May are beginning to show the effects of dry weather. On old groves, not so much in the foliage, but apparently the dry weather is taking quite a bit of the young fruit. There has even been some reports of picking operations having to stop because of the fruit being too soft.

Many growers by this date have applied their summer fertilizer application. However, it has been slowed up to make way for irrigation.

With the occurrance of warm weather the six-spotted mite problem has been greatly reduced and leaves which had six-spotted damage have begun to green up.

The last month or six weeks has seen a very sharp increase of both purple and red scale in most groves. It looks as though this summer that it will be especially important to apply the summer scale insecticides.

In many groves that received the post-bloom copper oil we have seen some heavy increases in rust mite infestation. Other than these blocks rust mite do not seem to be too much of a problem at this time.

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Uncle Bill Says:

A lot of us old fellers are sometimes inclined to bemoan the fact that things today ain't like they was in the old days . . . but I recon that if most of us had to go back to those old days when most of our farming chores was performed by main strength and awkardness . . . when we had to crank the old telephone by hand and then know fer a certainty that everything we said over the phone was being heard by most everybody else on our line . . . when our bathing habits usually called for a body washing in a tub out in the kitchen on Saturday nights . . . and when the fastest thing on wheels or on four feet was good Old Dan Patch, the famous race horse, maybe we'd be sort of glad that things today wasn't exactly like they was in the good old days.

When the first automobile struggled down the main street some of us said the durn thing was just a crazy gadget that wouldn't amount to anything, and when the Wright Brothers got the Kitty Hawk off the ground fer a few feet we knew plum well that nothin' as crazy as that would every become a major factor in our lives . . . but most of us today is drivin' around in fancy cars, doin' our plowing an cultivatin' with tractors instead of the old mule . . . and a lot of us is inclined to hop onto one of these here air liners when we want to git somewhere fast.

'Nother thing that has changed is that durin' the evenin's when we're resting instead of listening to chin music which sometimes wasn't too interetin' a lot of us is sittin' around listenin' to the radio or watchin' the television.

Yep it sure beats all how things of changed . . . 'n fer our money we don't want to go back to the old days . . . even the producin' of citrus and the growin' of vegetable crops has been greatly improved through the use of good fertilizers and good production practices which is a heap easier to follow than in the old days when we had to pick every bug off by hand and had to hoe every tree and every plant until our hands felt like leather . . . fer our money you kin keep the good old days.

ORGANIC FARMING WITH CHEMICAL FERTILIZERS —

(Continued from Page 19)

lizers, in spite of contrary advice from the organic farming press!

The question naturally arises as to what should be our policy with respect to the use of fertilizers under these circumstances. Very divergent views are being presented. I would like to discuss some of the extreme views first. The biggest agricultural problems at the moment, at least the one which is causing our friends in the Department of Agriculture the most headaches, is the problm of agricultural surpluses. I am happy to announce to this group today that I have thought up a solution to this problem which I will guarantee to solve the crop surplus problem in five years. If the Government will close all fertilizer plants for five years, I am sure that all the agricultural surpluses would disappear. And since you, as fertilizer men, have taken some credit for the 20 to 40 percent increase in production which has taken place in the last 15 years, I do not see how you can escape taking some responsibility for the surpluses! I shall pass over for the moment any objections you may raise to this solution of our problem and turn to one of the minor problems.

The organic farmers and gardeners probably would endorse enthusiastically the solution which I propose above. At least they advise against the use of chemical fertilizers. As most of you know, this small but vociferous group, made up largely of city agriculturists and not farmers, claim that chemical fertilizers are poisonous and hence should not be used. We should use, instead, organic fertilizers, preferably in the form of composts. Since your Committee asked me to speak on "Organic Farming with Fertilizers," I feel that I should examine the views of this group in a little more detail.

I, and I think that agronomist generally, subscribe to some of the views championed by the "organic farmers," or, if you prefer the term which our English colleagues use, the "Muck and Magic" farmers. We recognize the importance of soil organic matter in the maintenance of good soil structure. I have emphasized that in discussing some of the work on heavy soils in Ohio above. A year or so ago some chemists thought that the problem of soil structure would also be solved by a few pounds per acre of certain magical chemicals called soil conditioners. But most of us are now convinced that for the immediate future, at least, we shall have to depend upon the time-tested methods on most of our farms. We also agree with our friends in the organic school, that organic matter is a valuable form in which to store nutrients, especially nitrogen and phosphorous, a form in which they will be held against leaching when crops are dormant in the winter months. We think there is a real advantage in having some of the nutrients needed by crops stored in a form from which they can be released by micro-organisms as soon as the temperature becomes favorable for both crop and micro-organism. I cannot over-emphasize the importance of this property of organic matter to release its nutrients in synchrony with the needs of the growing crop. Farming a soil completely devoid of organic matter would be a headache for most farmers. It would be possible, as work with sand and gravel culture clearly shows, but it requires a degree of technical supervision which would make it impractical for general use.

I think we must keep an open mind, too, upon the possibility that certain types of organic matter when incorporated in the soil may have some antibiotic influence on certain types of plant pathogens. There is rather convincing evidence that the plowing under of large quantities of certain leguminous cover crops helps in the control of certain soil-borne diseases, like some of the root rots. There are other effects of organic matter which are probably of considerable significance, such as the effect of the CO_2 evolved in the decomposition of organic matter in increasing the hydrolysis and solubility of certain mineral nutrients in the soil. There is also the possibility that this increased concentration of CO_2 in the atmosphere next to the soil may have a growth stimulating effect on the lower leaves of very dense crops among which air movement is restricted. The practical significance of this has never been evaluated under field conditions, but work under controlled conditions leads me to think that it may possibly have some significance. CO_2 fertilization has been shown to be effective in greehouses.

On the other hand, the organic farmers make some claims to which I cannot subscribe. The general claim, for example, that crops grown with organic fertilizers only are free from disease. In spite of all the testimonials which they cite to contrary, I regard this claim as absurd. The potato blight which destroyed the potato crop and brought about a famine which decimated the population of Ireland took place before the widespread use of commercial fertilizers. Wheat rusts have caused famines in wheat producing regions which never have used the slighest amount of commercial fertilizers. Visit the vegetable markets in any country with a primitive agriculture where the use of chemical fertilizers, is unknown and sole dependence is placed on organic fertilizers, and you will find that the vegetables are so riddled with disease that an Ameri-

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can housewife would not think of buying them.

I cannot subscribe to the contention that crops fertilized properly with organic fertilizers are not attacked by insects. We have had invasions of grasshoppers since Biblical times; we have had invasions of Army worms and Japanese beetles, to mention only a few other cases, which do not discriminate, in their advance across the landscape, between the crops that have been fertilized with composts and those which have been fertilized with chemical fertilizers. I cannot support the claim that chemical fertilizers are poisonous and hence should never be used in food production. To a chemist, their arguments do make sense. Their logic runs as follows: Sulphuric acid is a poison — sulphuric acid is used in the manufacture of superphosphate — therefore, superphosphate is a poison. Let's apply this same logic to another well known chemical: Hydrochloric acid is a poison — sodium chloride can be made by compounding hydrochloric acid with another poison, caustic soda — therefore, sodium chloride, or ordinary table salt, is a poison!

The organic farmer also claims that the crops produced with their composts are superior nutritionally. This claim has been studied in many places, and so far as I have been able to find out, there is no valid evidence to support this claim. I have questioned the views of the organic farmer on entomology, plant pathology, chemistry and nutrition. Now let us examine their views from the standpoint of farm management and economics.

There is no question but that the properly made compost is a very good fertilizer. In terms of its plant food content, however, it is a very low-grade, very bulky fertilizer. It is made up of various materials such as garden waste, garbage, leaves, etc., well piled in the proper manner, moistened to the proper moisture content, turned on the average two to three times during the ripening process. Losses during this process are high. Frequently half of the organic matter is lost during the composting process. Commonly, 20 percent of the nitrogen in farm manure is lost during rotting and 76 percent of the available nitrogen disappears. All of this seems to me to indicate that making a compost of farm wastes is a rather wasteful process, wasteful of organic matter, wasteful of nitrogen, wasteful of human labor. We have made many studies of the best ways of handling the supplies of farm manure produced on our farms. These studies all indicate that the less handling the better. Wherever possible, our dairy farmers haul manure directly from the barns to the fields and plow it under as soon as possible. The cost of handling even this product, which is probably the most valuable of all organic manures, is, with the present price of labor on farms, so great that it is difficult for farmers who have no use for manure to get their neighbors to take it out of their barns for the hauling.

We have, then, two problems if we would follow the recommendations of our organic colleagues. First, to produce the vast amounts of organic matter that would be necessary, and, second, to supply the immense amount of labor that would be required to process and distribute it. By their foolish and unreasonable attitude toward chemical fertilizers, the organic farmers deprive themselves of the most powerful aid available to them for increasing the amount of organic wastes which could be used for organic manures. Without chemical fertilizers, the production of the amount of organic matter needed would be impossible in most areas.

(Concluded Next Issue)

LADYBUG FROM PAKISTAN IS RELEASED IN GROVES

A ladybeetle from Pakistan, with a voracious appetite for aphids, mites and scales, is expected to help Lake County citrus growers control these pests, says County Agent R. E. Norris. The beetles, known scientifically as Brumus saturals, were released last fall by U. S. Department of Agriculture entomologists. They were introduced in groves where spraying is kept to a minimum, in the hope they will become established more quickly.

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